Digital Health and Pandemics: What Covid-19 Reveals About the Challenges

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Covid-19 has been an eye-opener for digital health, with some expectations and promises realised, others unfulfilled and yet others taking us by surprise. While the crisis has, in many ways, boosted the use of technologies and data, unfolding events have also forced us to question our optimism, revise our expectations and discover new ideas. This article considers some of the lessons learned during the pandemic, and is written from the perspective of both an observer and a participant in this evolving landscape.

Data Science is not a Panacea. It needs good data and good science

Investment in health data science has been growing for over a decade, and its potential to improve health intelligence for disease surveillance, prediction and operational management is well known. In Covid-19, we have seen some governments relying very heavily on predictive models to guide their policies. But such models are only as good as the data, evidence and theory feeding them, and at the outset of this new disease, these could best be described as tentative.

In the UK, the fetishisation of data science led to early decisions to abandon widespread testing while allowing mass gatherings and international flight arrivals to continue. According to the prevailing model at that time, most symptoms would be minor and, by letting the disease run rife, the population would acquire 'herd immunity'. A subsequent model, drawing on new data and risk estimates, predicted that hundreds of thousands could die from pursuing this course of action, leading to an abrupt policy change, which took the country into a mass lockdown, with huge damage to the economy.

Epidemic modelling is incredibly complex since multiple factors need to be taken into account, all of which can change over time, requiring constant recalibration. The R number itself can be misleading, as the degree to which Covid-19 is infectious can vary between communities, depending on factors such as their population density or distance from cities. Some of the errors seen in data-driven policy have been blamed on a failure to involve enough interdisciplinary experts to ensure the full range of relevant influences were factored in, including social scientists and those with experience in managing global public health emergencies. As we move forward and negotiate an uncertain future of changing risks, evidence and policy responses, utilising all relevant experience and being able to draw on an expert judgement is essential for effective data-driven decision making.

AI Is not oven-ready, but Covid-19 is helping to accelerate it

In the lead-up to Covid-19, the hype about medical AI had reached epic levels, yet in Covid-19, pundits have been relatively subdued. What the pandemic shows us is that that, for many use cases, AI is not 'oven-ready' and much more work needs to be done to

make full use of it. It's certainly not the magic bullet that many tech optimists would have had us believe beforehand.

This is not to say that there hasn't been any worthwhile use of AI – indeed where vast numbers of complex calculations are required, AI is proving extremely useful. For example, laboratories are using high-performance computing and machine learning to speed up the discovery of vaccine candidates, to identify which parts of a viral cell are worth targeting, to score rapidly emerging scientific evidence, and to predict how long it will take before a viable vaccine is available.

The field of medical imaging was one of the first to benefit from AI, which is being used in Covid-19 to identify lung abnormalities, highlight signs of deterioration and calculate which patients are likely to benefit from ventilation. It is also being used in global research, to analyse international databases of lung images and to aid scientific networks collaborating to map the virus's genome.

Beyond descriptions of internet search trends, we are seeing less use of data science and AI to harness collective health intelligence and disease signals. However, with many governments now encouraging the use of self-tracking apps, participatory disease surveillance is presenting additional opportunities to understand how the illness is spreading, the effects of environmental factors and the impacts of interventions. Indeed, some governments are looking to bolt these tools onto electronic health records and even genetic databases in ambitious plans which resemble a global living laboratory, although governance concerns are likely to hinder their realisation.

Articles about AI in healthcare often centre on assistive human-like robots, yet in Covid-19 these have been discussed relatively little. Given their theoretical potential to be useful in such circumstances, this absence suggests either a lack of fitness-for-purpose or an unwillingness of profit-hungry companies to donate their nascent tools for the good of the world. It may be that practical robots, in the form of cleaning or delivery devices, are more useful than innovations like chatbots, which require a robust knowledge-base to drive their algorithms.

It can take a crisis to shift good ideas into practice, but we must take care

Although good examples exist, telemedicine has struggled to translate into routine practice, despite having been feasible in principle for nearly 20 years. Covid-19 has given it the kick it needed, with care at a distance becoming normalised and broadband video improving its ability to replicate the human experience. We are finding that previous fears, such as sacrificing accuracy or empathy, have subsided as people become more used to these approaches. However, more evidence of which methods are most appropriate under which circumstances is still required. While there will still be a need for in-person care, particularly for the elderly, telemedicine can help to reduce infection risks by blending this with other approaches, such as by guiding family members to undertake certain healthcare activities. For younger or more digitally able citizens, this type of communication is already the norm, even more so since Covid-19, and can be supplemented with a host of biometric tools embedded in the phones we now spend most of our lives beside.

Long-term challenges for telemedicine include protecting privacy and safety in a digital ecosystem whose connections and data flows can be hard to see—in the more immediate term, readjusting former workflows when national lockdowns end will be key. Unlike other areas where technology is decimating jobs, a shortage of skilled professionals is the biggest problem in healthcare. It is conceivable that these new, more convenient online methods of consulting will be able to help, by bringing more mothers and early-retirees back into the workforce on a part-time basis, continuing trends we have seen during Covid-19. With more connectivity between doctors, pharmacists and courier services, the need for physical trips to collect prescriptions may also become redundant.

We must, however, be careful not to automate-away the social and empathic aspects of care, which can be critical to its therapeutic value. Indeed, the perils of 'medicine by management consultant' are plain to see in health systems now struggling with supplies of protective equipment that were simply too lean to cope in a pandemic. Nonetheless, by cutting unnecessary waiting times and increasing availability using virtual methods, digital health offers new opportunities to augment the care experience and build relationships, with the right training. Focusing on this, rather than mere efficiencies, is likely to yield the greatest value for patients and society.

It's easy to over-compensate and neglect other priorities

One unintended effect of the coronavirus crisis has been a reduction in people's willingness to seek medical advice for other symptoms, which may be particularly dangerous in the case of life-threatening conditions like cancer. Among the possible reasons for this effect are the time it takes to recalibrate services from physical facilities to remote care, the exclusion of people without access to technology and the unhelpful framing of health communications.

Automated telephone messages designed to aid prioritisation may act as a deterrent, for example, "we are experiencing very high demand due to coronavirus. Do not continue unless you are seriously ill; otherwise seek information online". Such factors, coupled with people's fear of catching the virus at a health facility, have paradoxically left clinics specialising in non-infectious disease strangely empty during the crisis. At the same time, intensive care units struggle to cope.

Changes in patterns of physical and social activity caused by Covid-19 lockdowns and distancing measures are also leading to problems such as weight gain, increased alcohol consumption, depression and domestic abuse, which have been likened to a ticking time bomb for public health. Digital interventions for encouraging exercise and social connectedness need to be prioritised alongside infection control measures if these negative effects are to be avoided. Big data may also be able to shed light on how changing guidance on leaving home for exercise affects the incidence of confirmed cases or self-reported symptoms, allowing natural experiments in comparable regions with different policies.

Balancing citizens' privacy and safety rights is easier said than done

Controlling the spread of serious communicable illnesses has always presented an ethical dilemma between protecting the rights of the individual (to privacy or liberty) and the rights of others (for protection, or treatment if they may have been infected), as seen in the management of sexually transmitted diseases. Covid-19 presents similar challenges, although with entire populations being at risk and no direct physical contact required for transmission, the process of identifying, testing, tracing and quarantining cases and potential cases becomes vastly harder.

Many countries have been harnessing technology to assist with this task, some of them very intrusive, such as temperature scanners linked to facial recognition in public places, or digital ankle tags to enforce home quarantine. Citizens in Western countries have been less happy to submit to the levels of surveillance seen in other parts of the world, although similar technologies are being slowly introduced. One of the most divisive issues has been location tracking, with some governments co-opting their mobile network providers to share people's GPS coordinates, others preferring fully decentralised, consent-driven, privacy-preserving Bluetooth proximity tracking, and others using hybrid systems that combine the latter with some data gathering by public health agencies. In Europe, the debate over different approaches has become highly politicised, and governments have been forced to make radical changes to their digital contact-tracing strategies in response to pressure from privacy advocates.

Cybersecurity has also been a key issue, with flaws in code or deliberate backdoors risking the leakage of personal information to hackers, corporate entities, or other government agencies such as the police.

The main lesson that has emerged from this drama, beyond security and privacy, is the need for citizens to be able to trust their institutions to be honest about what they are doing, proportionate in using only the tools or data necessary for pandemic management, and effective enough to ensure the security of systems and databases.

In the months that follow, governments will have the benefit of hindsight and vicarious learning from watching one another succeed or fail. With any luck, this will create more mature conversations and agreements about how to move forward in a trustworthy way that also ensures the best use of digital health for the safety of citizens and can support appropriate cross-border data sharing for collective pandemic intelligence.

Business interests and players need to be actively managed

As with other sectors where big money can come from technology contracts, and big data can hand great power to those who possess it, corporate interests are never very far away from digital health. This is unlikely to be any different in the case of Covid-19 and risks wasteful procurement decisions and unwise data sharing agreements being made without adequate due diligence. Beyond this, we are seeing powerful industry players move into Covid-19 efforts where weak institutions have left a void; for example, in the USA, the mayor of New York has partnered with technology and finance billionaires to create what has been described as a "screen deal" offering a "permanent and profitable no-touch future"[1]. Meanwhile, in China, the government's power over

[1] https://theintercept.com/2020/05/08/andrew-cuomo-eric-schmidt-coronavirus-tech-shock-doctrine/

digital businesses and city authorities provides the perfect conditions for mass surveillance and control. Ironically, in future, these geopolitical opposites may soon be more alike than we might wish to acknowledge.

We can draw some comfort from Europe's world-leading emphasis on responsible innovation and data protection but ensuring the fair and appropriate balance of power between states, citizens and industry has never been more vital, particularly as information governance thresholds are temporarily lowered to aid pandemic efforts.

Global technology companies are now moving within the inner circles of government, as advisors, analysts, service providers and co-creators of new data-driven approaches. While public-private collaboration is inevitable and may be helpful, the involvement of players like Palantir – better known for its role in crime and terrorism analytics – raises the spectre of more invasive and coercive measures to come. Effective oversight of government departments forging these deals is also essential to prevent scope creep or conflicts of interest.

Conclusion: What are the hopes for Europe?

Answering this question depends on which Europe it refers to. Despite its shared institutions, national health systems, governments and societies still operate in very different ways across the continent, in terms of their command of resources, their medical and digital infrastructures and the expectations of their citizens. In Covid-19, we are witnessing wide variations in approaches to social distancing and the use of technology to inform operational and strategic decision making. Some of these differences can be traced to resource capabilities, others to economic priorities, public demand or political ideologies. Of course, nations should have the right to manage public health as they feel it appropriate. Still, if we are to effectively manage this pandemic across the continent and prepare for the next one, we need standards, agreements, and the means to ensure strategic alignment.

It is said that tragedy brings people together. Let's hope Covid-19 moves us towards a fairer, wiser, collaborative future for digital health.

Subtitles

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Quotes

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